

Mitchell (J. K.)

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**PRELIMINARY NOTE ON THE EFFECT OF
MASSAGE ON THE BLOOD-COUNT.¹**

By JOHN K. MITCHELL, M.D.,
OF PHILADELPHIA.

WHILE the manipulations of massage have always been said to increase the circulation and promote the movement of blood, it has never, I think, been definitely ascertained what the exact effect upon the blood itself is. In the examination of some recent cases I have had results so startling and so new that I thought them of sufficient interest to justify brief mention to the College to-night, and in advance of the fuller study on which I have already entered.

In the first case, a patient the subject of a very chronic lead-poisoning from drinking-water, with marked anemia, the blood was examined three times before any massage was practised, and the counts were, respectively, 3,725,000 red corpuscles to the c.mm., 4,000,000, and 4,100,000. The percentage of hemoglobin was always the same—a little over 30. On the fourth day careful massage of the abdomen alone was applied, lasting twenty-five minutes. Ten minutes after the ending of the

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manipulation I examined the blood, and found the red corpuscles 4,500,000, and the white corpuscles, which had previously not been in excess, as 1 to 85 red. The percentage of hemoglobin was not measurably increased. On the fifth day, after general massage lasting one hour, the count showed 6,500,000 red corpuscles, and the same percentage of hemoglobin.

In the second case, a woman from Mississippi, aged forty-two, with a very pallid appearance, decided malarial cachexia, and slight enlargement of the spleen, the first count, made before massage, was 4,700,000, and the hemoglobin 70 per cent. The white corpuscles on this occasion, two hours and a half after the meal, were in the ratio of 1 to 120 red. After one hour's general massage the number of red corpuscles had increased to almost exactly 7,000,000, and the number of white had a ratio of 1 to 38. No further examinations of this case were made on account of the supervention of the patient's menstrual flow.

The third patient, a healthy adult, had a count before massage of 5,675,000, and 110 per cent. of hemoglobin, with no excess of white corpuscles. After massage the red corpuscles were 7,900,000, and the hemoglobin fully 120 per cent. I could not find in this case that there was any excess of white corpuscles, but I had the opportunity of making but one examination, and did not use the only satisfactory method of counting these corpuscles, *i. e.* by a separate examination with a 5 per cent. solution of acetic acid.

The fourth case was one of suspected early loco-

motor ataxia in an adult male, who, for some weeks had been in hospital under daily massage treatment and quiet, with good food. He had not been rubbed for three days previous to the examination. His count before massage was 6,575,000 red corpuscles, and hemoglobin 110 per cent. At a second examination, on another day, the count was 7,325,000 red corpuscles. On the same day, after massage, he had 7,340,000, a very small increase, and no increase in the amount of hemoglobin.

The fifth case was in a boy of fourteen, who had transverse myelitis, in course of recovery, and had been daily rubbed for some weeks. His count before massage was 6,900,000, with 90 per cent. of hemoglobin, and after massage 8,100,000, with 100 per cent. full of hemoglobin.

I should add that for several of these examinations I am indebted to the kind assistance of Dr. Charles W. Burr, who used a different instrument than mine. They were all made at about the same hour of the day, and, so far as possible, with similar conditions surrounding the patients—a matter of some importance when we recall the great changes that take place in the number of red and white corpuscles in the veins at different hours of the day and in different relations to meal-times. Bernard, indeed, showed that the total amount of blood was so much increased during digestion that an animal could be bled to a greater extent without injury after feeding than before.

This effect of massage does not seem impossible when one recalls how the bloodvessels look when seen

in a frog's foot under the microscope. In the lesser capillaries there appears, every now and then, to be a clogging, and, for a time, the corpuscles scarcely move. When this state is overcome, a like condition is evident in another little vessel. Even in larger vessels, many corpuscles seem not to share in the general movement, and to be temporarily out of the current; the white ones especially cling along the walls, and some of the red ones progress less rapidly than others, or linger for an instant as if they were in an eddy or a side-current; it is probably literally true that there is a "side-current," the serum nearest the walls moving more slowly than that in the central stream. A portion of the blood, therefore—and when the whole capillary system is taken into account, it must be a large portion—is not at all times in active circulation.

It is easy to imagine that the alternate compression and expansion of the veins and arteries during deep massage, and the consequent pumping of blood through them, must push many of the corpuscles that are lingering in the by-ways of the circulation into the full stream of the blood-current, and make a demand upon the various reservoirs and factories of red and white corpuscles for further supplies to take their places.

While, as I said at first, the number of cases is too small to make certain the constancy of this very remarkable change after massage, it seems to me of sufficient importance to justify this imperfect preliminary statement. Even so far as it has gone, it suggests matters of novelty both in physiology and in clinical medicine.